



The present invention relates to a fuel filter for an internal combustion engine, equipped with a quick fastening cover.

There are known several fuel filters, particularly filters for feeding gas oil to internal combustion engines, mainly of motor vehicles.

Since these devices are to be mass-produced, both for the original equipment of motor vehicles and as spare parts, it is important to reconcile the product reliability and quality with a low manufacturing cost thereof.

A fuel filter for internal combustion engines is disclosed in the Italian Utility Model Application No.53316-B/88 in the name of the present Applicant. In such a type of filter a paper filter element is housed within a plastic cylindrical case to be screwed onto a suitably threaded connection provided in the engine. The case is closed by a cover having a number of holes for the fuel passage and suitable seals. The cover is fastened to the case upper lip by means of a welding and in order to allow this latter corresponding grooves are formed in the case and in the cover to collect the so produced swarf material.

This solution has some drawbacks both for what concerns the product quality and the manufacturing cost thereof.

The object of the present invention is that of overcoming or at least reducing the drawbacks of the known filters, by providing a fuel filter for an internal combustion engine wherein the cover can be fastened to the case through a simple and easy operation, without thermal treatments.

Another object of the invention is that of providing a fuel filter adapted to be made in two alternative embodiments, one of the type to be screwed onto a suitable fix or connection (spin-on), and the other of the type connectible to the fuel supply line through ducts, both embodiments incorporating a common main structure.

The above and other objects and advantages of the invention as will be clear from the rest of the description, are achieved by a fuel filter for an internal combustion engine comprising a plastic material cylindrical case housing a filter element above a settlement chamber defined at the case bottom, and a cover also of plastic material for closing said case, provided with fuel inlet openings and fuel outlet openings, characterized in that said case terminates with an upper collar provided with helical screwing means adapted to cooperate with complementary helical screwing means on the collar of the cover, and in that said screwing means are both associated with clamping oblique teeth for the permanent blocking of said cover to said case.

An additional characteristic of the filter according to the invention is that the case bottom wherein a settlement chamber for the fuel is formed is

provided with a series of radial projections that stiffen the structure and are integrally formed with the case, defining upwardly a rest plane for said filter element.

A preferred embodiment of the invention will now be described with reference to the attached drawings, in which:

- Fig. 1 is an axial cross section view of a first embodiment of the filter according to the invention;
- Fig. 2 is a top plan view of the filter of Fig. 1 with the cover taken away;
- Fig. 3 is a part section top plan view of the filter cover of Fig. 1;
- Fig. 4 is an axial cross section of the cover according to an embodiment of the screwing system;
- Fig. 5 is a partial view of the case according to an embodiment of the screwing system of Fig. 4;
- Fig. 6 is a part section top plan view of a second embodiment of the filter cover of Fig. 3;
- Fig. 7 is a cross section view along line VII-VII of the cover of Fig. 6;
- Fig. 8 is a part section top plan view of a third embodiment of the filter cover of Fig. 3;
- Fig. 9 is an axial part section view of the cover of Fig. 8;
- Fig. 10 is a part section top plan view of a fourth embodiment of the filter cover of Fig. 3; and
- Fig. 11 is an axial part section view of the cover of Fig. 10.

With reference to Fig. 1, there is shown a first embodiment of a fuel filter for engines of vehicles according to the invention. The filter substantially comprises a cylindrical case 1 housing a filter element 2 and closed by a cover 3. Both the case 1 and the cover 3 are of a plastic material having suitable characteristics, in case filled with glass fibers or other substances adapted to increase the mechanical and thermal resistance to the values desired for a specific application. The case and the cover can therefore be inexpensively manufactured by moulding. The filter element 2 is formed by crepe paper wrapped around a central tube 4 as it is known in the art.

As shown in Figures 1 and 2, the bottom of the case 1 is provided with a series of projections 5 raising from the case bottom that extend radially but terminate before the center of the case. Such radial projections stiffen the lower portion of the case structure which is bound to be stressed by compression either manually or by means of a tool when the filter is screwed onto the engine. Since all the projections have the same height, the projections 5 provide a flat resting surface for the filter

element 2. To this aim each of the projections 5 comprise an upper rib 7 shaped as a circle arc at the inner end of the projections: the whole of the ribs 7 forms a centering sleeve onto which the filter element 2 is fitted through the axial hole of the tube 4.

Thus a settlement chamber 10 is defined below the filter element 2, at the bottom of which a drain hole 12 is provided that is closed by a screw plug 13.

The case 1 terminates upwards with an inwardly tapered collar 14 adapted to engage a circular groove 21 with a conical cross section in the cover 3, and provided on its outer surface of helical projections 15 that are relatively short and inclined. In correspondence with the end portion of each projection 15 an array of oblique teeth 17 directed upward is moulded on the rest projection 16, the oblique teeth extending between each helical projection 15.

The case 1 is watertight sealed by a cup shaped cover 3 provided with inlet and outlet openings for the fuel to be filtered.

In the embodiment of Figures 1, 3 and 4, the cover 3 is of the type allowing for the filter to be screwed onto a threaded fix or connection projecting from the engine or from that portion (not shown) of the fuel supply line to which the filter is to be applied. Therefore the cover is equipped with a central threaded hole 19 also acting as an outlet opening of the filtered fuel. The cover is further provided with a series of openings 20 located on a circle having a diameter that is about one half the cover diameter, acting as inlet openings of the fuel to be filtered. On the outer face of the cover there are provided two annular seal gaskets 22 and 23, the former being outside the holes 20 and the latter being located between the holes 20 and the central hole 19. The gaskets 22 and 23 are forcibly received in circular grooves 24 and 25 ensuring the correct positioning of the gaskets when the filter is screwed onto the threaded fix or connection. Preferably the cross section of the grooves 24 and 25 is trapeziform.

As indicated, the cover 3 is of the cup shaped type, with the concavity towards the case. Within the cover, along the side wall thereof, there are provided helical grooves 27 having the same inclination as the threads or helical projections 15 of the case 1. On the collar of the case 1 there is formed an array of downwardly directed oblique teeth 28, whose direction of inclination (slant) is the same as that of teeth 17 of the case 1. Such construction allows for the cover 3 to be screwed onto the case 1 by means of a quick movement thanks to the inclination of the projections 15 and the grooves 27 and to the fact that both are relatively short, so that the cover is brought from a

5 starting position to a final position of complete screwing through a fraction of turn. After the screwing has been completed, by imparting a further torsion to the cover, the teeth 28 are driven to move over the back of the teeth 17 of the case, which is possible due to the fact that they both are inclined the same way. After this operation, the fastening of the cover has become irreversible, that is permanent, since the unscrewing thereof is prevented by the ratchet and gear engagement between the two arrays of teeth 17 and the teeth 28 with each tooth 17 acting as a ratchet or pawl with respect to the teeth 28 on the cover so that this latter can no longer be turned in a direction opposed to the one that caused the screwing thereof.

10 This way it becomes possible to assemble together the case and the cover by means of a simple and quick mechanical operation. When the cover has been fastened, the sleeve 29 defining the axial hole 19 is fitted into the tube 4 (Fig. 1) and thanks to its slightly frusto-conical external configuration, it ensures the seal between the incoming fuel flow through the holes 20 and the outlet fuel flow through the hole 19.

20 25 Figures 4 and 5 show an embodiment of the screwing system of the cover to the case obtained by means of helical grooves 15' on the collar 14' of the case 1' below which are located the clamping teeth 17' outwardly directed and by means of relatively short projections 27' and inclined inwardly of the collar of the case under which projections are provided the teeth 28' turned inwardly of the cover and correspondingly oblique with respect to the teeth 17' on the collar of the case.

30 35 The operation of the above illustrated filter is well known: the fuel to be filtered, usually gas oil, penetrates the filter through the holes 20 and flows through the filter element 2 reaching the settlement chamber 10. Here the water and other settled impurities to be periodically drained through the hole 12 are collected, then the filter fuel flows upwardly through the axial hole 8 from the tube 4 and comes out through the central hole 19 in the cover 3.

40 45 Figures 6 and 7 show another embodiment of the filter cover according to the invention, generally designated with 30.

50 55 Such cover can be fastened the same way as shown above for the cover 3 to the case 1 since the portion to be mated with the case is the same in both embodiments. The difference between the cover 30 and the cover 3 is that the cover 30 is provided with elbow ducts 32 and 33 integrally formed with the cover body by moulding, for the fuel inlet into and the fuel outlet from the filter, respectively. Duct 32 opens into the filter chamber 34 over the filter element, whereas duct 33 is located at an axial position aligned with the tube 4 that has already been discussed with reference to

the case 1. An air venting hole 35 is further provided for in the cover which is normally closed by a screw 36. A frusto-conical collar or sleeve 39 projecting within the cover is provided for the seal connection between the tube 4 and the case 1.

By assembling together the cover 30 and the case 1 one obtains a filter that needs no longer to be screwed for the connection to the fuel supply line, but rather one that is to be directly connected to the line through the ducts 32 and 33. The connection is achieved by fitting the end portions of the ducts 32 and 33 into the pipes of the fuel supply line and blocking them together by means of hose clamps.

Figures 8 and 9 show a third embodiment of the cover generally designated at 40. The cover 40 is different from the previous illustrated embodiments in that the ducts 41 and 42 are of the quick connection type. They are provided with portions 43 and 44 adapted to sealingly fitting corresponding portions provided at the ends of the fuel supply pipes (not shown). Such portions include one or more seal gaskets and allow for the pipe fastening by simply press fitting of the portions 43 and 44 of the ducts 41 and 42. Several types of quick coupling devices are commercially available.

Figures 10 and 11 show a fourth embodiment of the cover that is on the whole designate at 50. In this embodiment the ducts 51 and 52 are no longer integrally formed with the cover, but rather separately built and then rotatably mounted on the cover. The cover therefore is provided with two holes having a proper diameter to receive the ducts 51 and 52. In the axial hole into which the outlet duct 52 is fitted there is provided a gasket 54 formed by two sealing ribs held in the proper position by a rigid insert 55 that in turn is equipped with a rib 56 binding the axial position thereof. The lower portion of the duct is slightly conical and is formed with a tooth 58 so as to allow the insertion into the hole and prevent the later extraction thereof. The inlet duct 51 is fitted into the peripheral hole formed in a portion of the cover having a reduced thickness with respect to the central portion. Consequently the gasket 59 is a simple seal ring, e.g. an O ring, again held in position by an insert 60 equipped with a fastening rib 61. The ducts 51 and 52 can be formed with quick coupling connections 63 and 64, or being terminated by conventional components requiring hose clamps for the fastening of the gas oil supply pipes, as shown in Figures 6 and 7.

Thanks to the embodiment shown in Figures 10 and 11 the elbow ducts 51 and 52 can be radially oriented as desired in order to select the optimum position for mounting the filter in the gas oil supply line to the engine.

There have been disclosed some preferred

embodiments of the invention the nevertheless can be subjected to modifications and changes within the scope of the inventive idea.

5      **Claims**

1. A fuel filter for an internal combustion engine comprising a plastic material cylindrical case (1; 1') housing a filter element (2) above a settlement chamber (10) defined at the case bottom, and a cover (3; 3'; 30) also of plastic material for closing said case (1), provided with fuel inlet openings (20; 32) and fuel outlet openings (19; 33), characterized in that said case (1; 1') terminates with an upper collar (14; 14') provided with helical screwing means (15; 15') adapted to cooperate with complementary helical screwing means (27; 27') on the collar of the cover (3; 3'; 30), and in that said screwing means (15; 15') and (27; 27') are both associated with clamping oblique teeth (17; 17') for the permanent blocking of said cover (3; 3'; 30) to said case (1; 1').
2. A filter as claimed in claim 1, characterized in that said case (1) has a tapered collar (14) and in that the cover (3) has a circular groove (21) with a conical cross section adapted to receive the tapered collar (14) of the case.
3. A filter as claimed in claims 1 and 2, characterized in that the helical screwing means on the collar of the case (1) and those on the collar of the cover (3) are made up by relatively short helical projections and inclined (15) and helical grooves (27), respectively, and in that the oblique teeth (17) associated to the projections (15) and those (28) associated to the grooves (27) are located on the rest projection (16) of the collar (14) of the case (1) as an upwardly directed array and on the collar of the cover (3) as a downwardly directed array, respectively, said oblique teeth being adapted to prevent the unscrewing of the cover (3) from the case (1).
4. A filter as claimed in claim 1, characterized in that the helical screwing means on the collar (14') of the case (1') and on the collar of the cover (3') are made up by helical grooves (15') and relatively short and inclined helical projections (27'), respectively, and in that the oblique teeth (17') associated to the helical grooves (15') and those (28') associated to the helical projections (27') are both located as an array below the grooves (15') of the case (1) and below the projections (27') of the cover (3'), respectively, said oblique teeth (17') and (28')

being adapted to prevent the unscrewing of the cover (3') from the case (1')

5. A filter as claimed in claim 1, characterized in that the bottom of said settlement chamber (10) of the case (1; 1') is provided with radially extending projections (5) that terminate before the center of the case and upwardly define a flat rest surface for said filter element (2). 5

10

6. A filter as claimed in claim 1, characterized in that said cover (3; 3') is provided with eccentric holes (20) for the fuel inlet and with an axial threaded hole (19) for the fuel outlet and the filter fastening, and with a pair of ring-shaped seal gaskets (22, 23) forcibly received in seats (24, 25) one (25) of which being located between said threaded axial hole (19) and said eccentric holes (20), and the other (24) of which being located outside said eccentric holes (20). 15

20

7. A filter as claimed in claim 6, characterized in that said threaded axial hole (19) is defined in a sleeve terminating downwardly with a frustoconical portion (29) for the coupling with a tube (4) of the filter element (2). 25

25

8. A filter as claimed in claim 1, characterized in that said cover (30) is provided with fuel inlet ducts (32) and outlet ducts (33) that are integrally formed with said cover and are elbow-bended outside it. 30

30

9. A filter as claimed in claim 8, characterized in that said inlet ducts are equipped with quick connection fixes or connections (43, 44) for the connection to the fuel supply line. 35

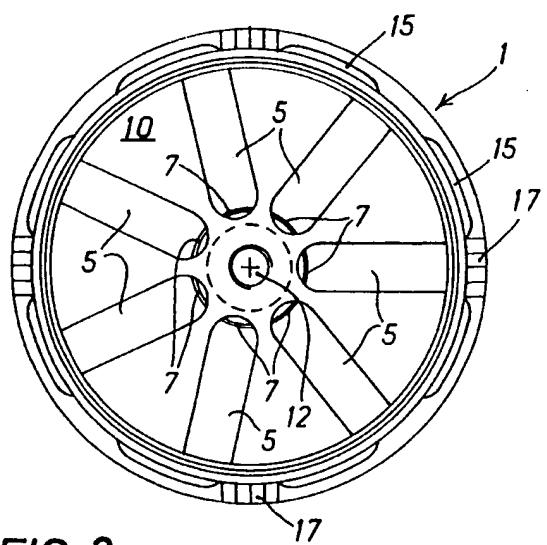
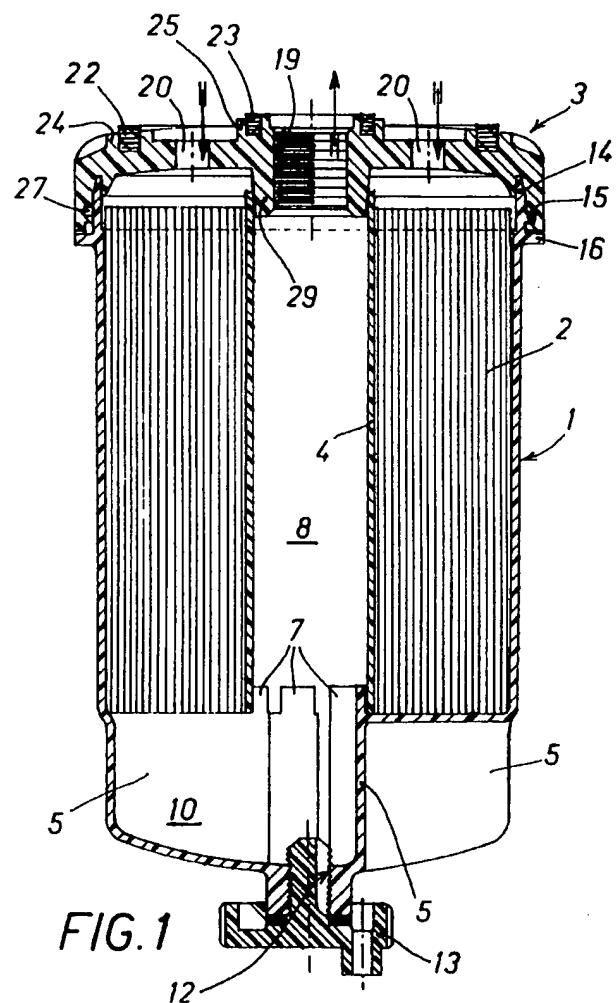
35

10. A filter as claimed in claim 1, characterized in that said cover (50) is equipped with fuel inlet ducts (51) and fuel outlet ducts (52) separately formed from the cover (50) and rotatably mounted into holes in said cover. 40

40

45

11. A filter as claimed in claim 10, characterized in that between said elbow ducts (51, 52) and said cover holes there are interposed a seal gasket (59; 54) and an insert (60; 53) for the fastening of said gasket. 50



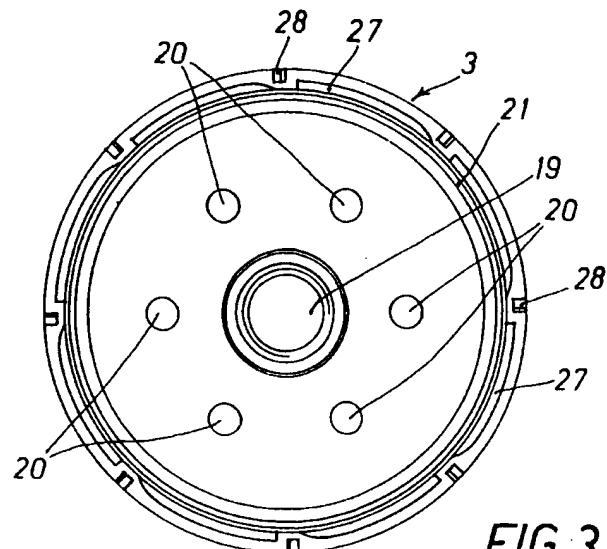


FIG. 3

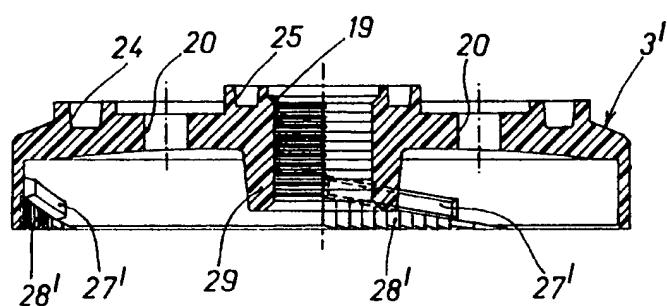


FIG. 4

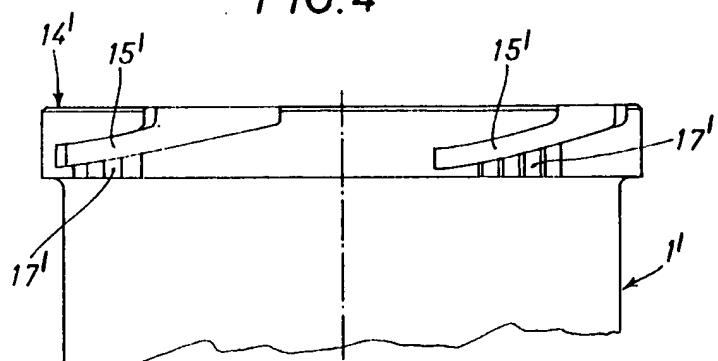


FIG. 5

FIG. 6

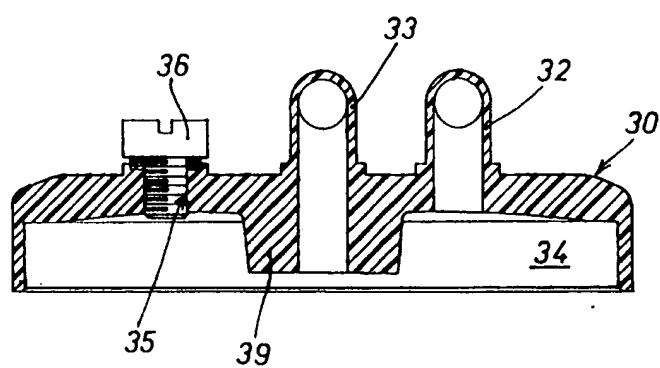
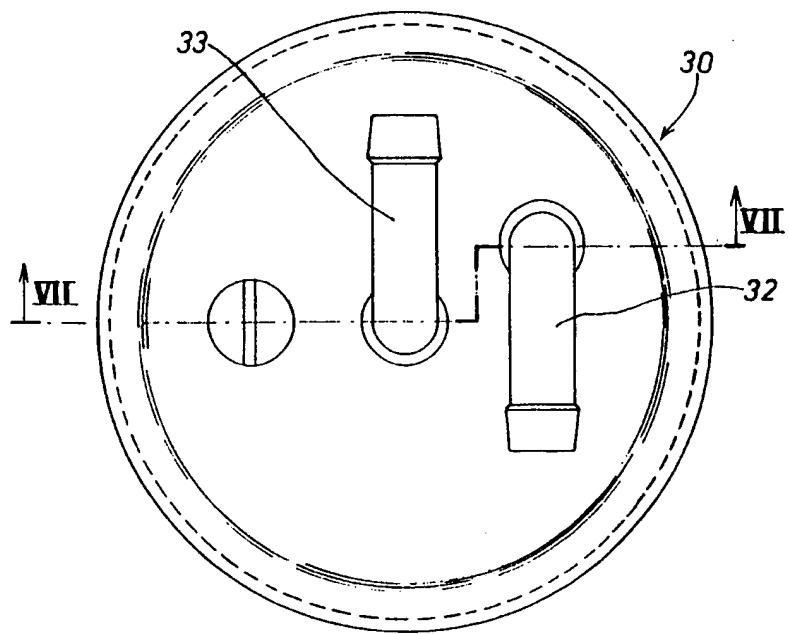


FIG. 7

FIG. 8

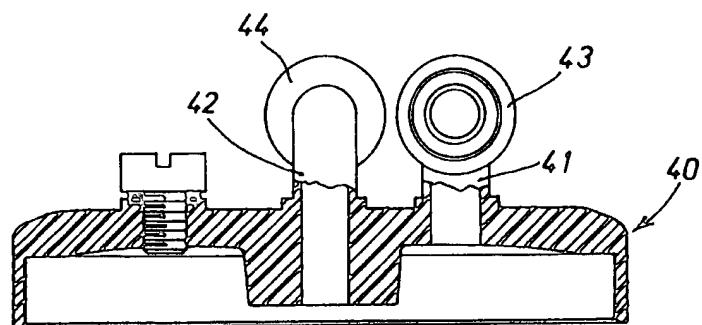
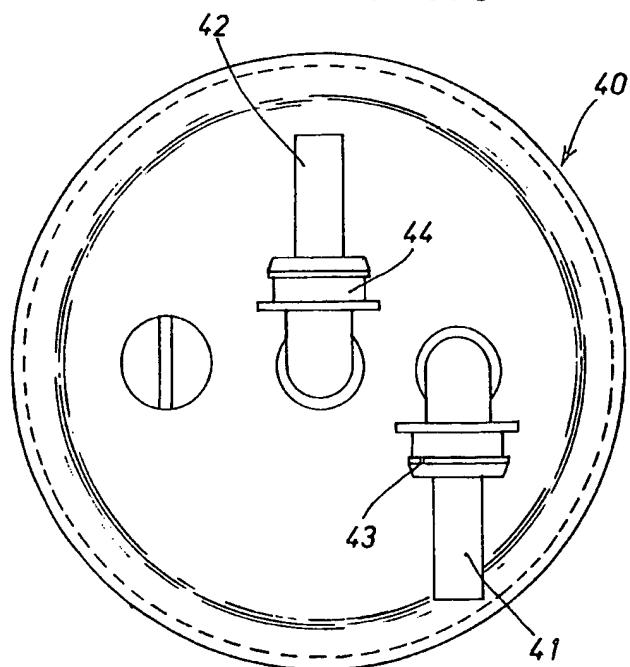


FIG. 9

FIG. 10

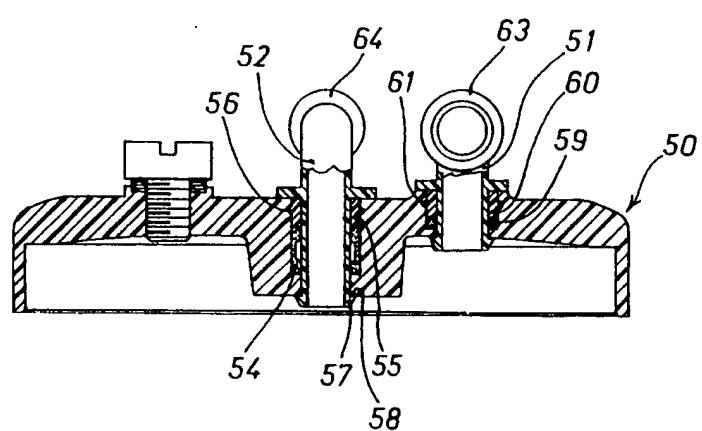
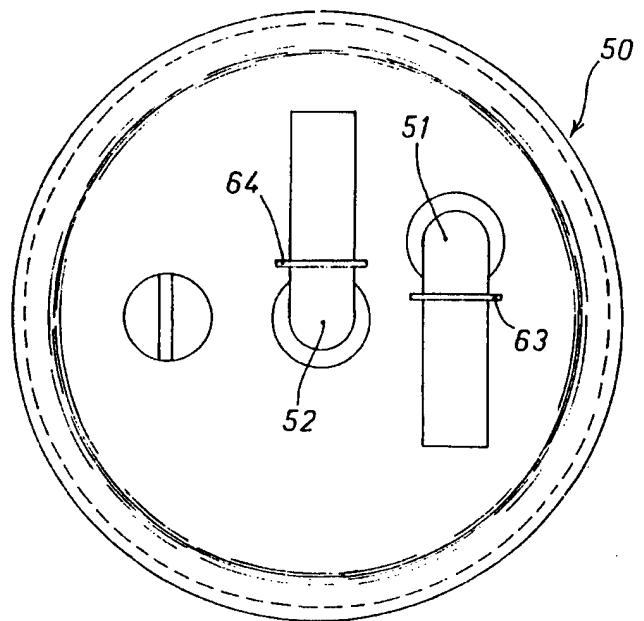


FIG. 11



European Patent  
Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 91112402.2
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL.5)
Y	<u>US - A - 1 361 243</u> (FUSON) * Totality * --	1,8	F 02 M 37/22
Y	<u>US - A - 4 289 248</u> (LYNN) * Fig. 1-4 * --	1,8	
A	<u>US - A - 1 730 475</u> (PELLETIER) * Totality; especially numerals 11,16,26-29 * --	1	
A	<u>US - A - 1 609 381</u> (NORD) * Totality * ----	1,10	
TECHNICAL FIELDS SEARCHED (Int. CL.5)			
F 02 M 37/00 B 65 D 41/00			
The present search report has been drawn up for all claims			
Place of search VIENNA	Date of completion of the search 13-11-1991	Examiner PIPPAN	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			



Europäisches Patentamt  
European Patent Office  
Office européen de brevets



(11) Publication number : **0 470 440 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification :  
**27.04.94 Bulletin 94/17**

(51) Int. Cl.<sup>5</sup> : **F02M 37/22**

(21) Application number : **91112402.2**

(22) Date of filing : **24.07.91**

(54) **A fuel filter equipped with a quick fastening cover for an internal combustion engine.**

(30) Priority : **08.08.90 IT 6762790**

(43) Date of publication of application :  
**12.02.92 Bulletin 92/07**

(45) Publication of the grant of the patent :  
**27.04.94 Bulletin 94/17**

(84) Designated Contracting States :  
**AT BE CH DE DK ES FR GB GR IT LI LU NL SE**

(56) References cited :  
**US-A- 1 361 243  
US-A- 1 609 381  
US-A- 1 730 475  
US-A- 4 289 248**

(73) Proprietor : **GILARDINI S.p.A.  
Via Cuneo No. 20  
I-10152 Turin (IT)**

(72) Inventor : **Baracchi, Fabrizio  
Via Isernia 5/A  
I-10151 Turin (IT)  
Inventor : Casalicchio, Silvano  
Via Pinerolo-Susa 33  
I-10090 Bruino, Turin (IT)  
Inventor : Gallino, Mauro  
Via Golto 14  
I-10095 Grugliasco (IT)  
Inventor : Tarditi, Luigi  
Via Moffa di Lisio 1  
I-10064 Pinerolo, Turin (IT)**

(74) Representative : **Robba, Eugenio et al  
Studio "INTERPATENT" via Caboto 35  
I-10129 Turin (IT)**

**EP 0 470 440 B1**

Note : Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent grant. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

## D c r i p t i o n

The present inv ntion relates to a fuel filter for an internal combustion engine, quipped with a quick fastening cover.

There are known several fuel filters, particularly filters for feeding gas oil to internal combustion engines, mainly of motor vehicles.

Since these devices are to be mass-produced, both for the original equipment of motor vehicles and as spare parts, it is important to reconcile the product reliability and quality with a low manufacturing cost thereof.

A fuel filter for internal combustion engines is disclosed in the Italian Utility Model Application No.53316-B/88 in the name of the present Applicant. In such a type of filter a paper filter element is housed within a plastic cylindrical case to be screwed onto a suitably threaded connection provided in the engine. The case is closed by a cover having a number of holes for the fuel passage and suitable seals. The cover is fastened to the case upper lip by means of a welding and in order to allow this latter corresponding grooves are formed in the case and in the cover to collect the so produced swarf material.

This solution has some drawbacks both for what concerns the product quality and the manufacturing cost thereof.

The object of the present invention is that of overcoming or at least reducing the drawbacks of the known filters, by providing a fuel filter for an internal combustion engine wherein the cover can be fastened to the case through a simple and easy operation, without thermal treatments.

Another object of the invention is that of providing a fuel filter adapted to be made in two alternative embodiments, one of the type to be screwed onto a suitable fix or connection (spin-on), and the other of the type connectible to the fuel supply line through ducts, both embodiments incorporating a common main structure.

The above and other objects and advantages of the invention as will be clear from the rest of the description, are achieved by a fuel filter for an internal combustion engine comprising a plastic material cylindrical case housing a filter element above a settlement chamber defined at the case bottom, and a cover also of plastic material for closing said case, provided with fuel inlet openings and fuel outlet openings, characterized in that said case terminates with an upper collar provided with helical screwing means adapted to cooperate with complementary helical screwing means on the collar of the cover, and in that said screwing means are both associated with clamping oblique teeth for the permanent blocking of said cover to said case.

An additional characteristic of the filter according to the inv ntion is that the case bottom wherein a set-

lement chamber for the fuel is formed is provided with a series of radial projections that stiffen the structure and are integrally formed with the case, defining upwardly a rest plane for said filter element.

5 A preferred embodiment of the invention will now be described with reference to the attached drawings, in which:

- Fig. 1 is an axial cross section view of a first embodiment of the filter according to the invention;
- Fig. 2 is a top plan view of the filter of Fig. 1 with the cover taken away;
- Fig. 3 is a part section top plan view of the filter cover of Fig. 1;
- Fig. 4 is an axial cross section of the cover according to an embodiment of the screwing system;
- Fig. 5 is a partial view of the case according to an embodiment of the screwing system of Fig. 4;
- Fig. 6 is a part section top plan view of a second embodiment of the filter cover of Fig. 3;
- Fig. 7 is a cross section view along line VII-VII of the cover of Fig. 6;
- Fig. 8 is a part section top plan view of a third embodiment of the filter cover of Fig. 3;
- Fig. 9 is an axial part section view of the cover of Fig. 8;
- Fig. 10 is a part section top plan view of a fourth embodiment of the filter cover of Fig. 3; and
- Fig. 11 is an axial part section view of the cover of Fig. 10.

With reference to Fig. 1, there is shown a first embodiment of a fuel filter for engines of vehicles according to the invention. The filter substantially comprises a cylindrical case 1 housing a filter element 2 and closed by a cover 3. Both the case 1 and the cover 3 are of a plastic material having suitable characteristics, in case filled with glass fibers or other substances adapted to increase the mechanical and thermal resistance to the values desired for a specific application. The case and the cover can therefore be inexpensively manufactured by moulding. The filter element 2 is formed by crepe paper wrapped around a central tube 4 as it is known in the art.

As shown in Figures 1 and 2, the bottom of the case 1 is provided with a series of projections 5 rising from the case bottom that extend radially but terminate before the center of the case. Such radial projections stiffen the lower portion of the case structure which is bound to be stressed by compression either manually or by means of a tool when the filter is screwed onto the engine. Since all the projections have the same height, the projections 5 provide a flat resting surface for the filter element 2. To this aim each of the projections 5 comprises an upper rib 7 shaped as a circle arc at the inner end of the projec-

tions: the whole of the ribs 7 forms a centering sleeve onto which the filter element 2 is fitted through the axial hole of the tube 4.

Thus a settlement chamber 10 is defined below the filter element 2, at the bottom of which a drain hole 12 is provided that is closed by a screw plug 13.

The case 1 terminates upwards with an inwardly tapered collar 14 adapted to engage a circular groove 21 with a conical cross section in the cover 3, and provided on its outer surface of helical projections 15 that are relatively short and inclined. In correspondence with the end portion of each projection 15 an array of oblique teeth 17 directed upward is moulded on the rest projection 16, the oblique teeth extending between each helical projection 15.

The case 1 is watertight sealed by a cup shaped cover 3 provided with inlet and outlet openings for the fuel to be filtered.

In the embodiment of Figures 1, 3 and 4, the cover 3 is of the type allowing for the filter to be screwed onto a threaded fix or connection projecting from the engine or from that portion (not shown) of the fuel supply line to which the filter is to be applied. Therefore the cover is equipped with a central threaded hole 19 also acting as an outlet opening of the filtered fuel. The cover is further provided with a series of openings 20 located on a circle having a diameter that is about one half the cover diameter, acting as inlet openings of the fuel to be filtered. On the outer face of the cover there are provided two annular seal gaskets 22 and 23, the former being outside the holes 20 and the latter being located between the holes 20 and the central hole 19. The gaskets 22 and 23 are forcibly received in circular grooves 24 and 25 ensuring the correct positioning of the gaskets when the filter is screwed onto the threaded fix or connection. Preferably the cross section of the grooves 24 and 25 is trapeziform.

As indicated, the cover 3 is of the cup shaped type, with the concavity towards the case. Within the cover, along the side wall thereof, there are provided helical grooves 27 having the same inclination as the threads or helical projections 15 of the case 1. On the collar of the case 1 there is formed an array of downwardly directed oblique teeth 28, whose direction of inclination (slant) is the same as that of teeth 17 of the case 1. Such construction allows for the cover 3 to be screwed onto the case 1 by means of a quick movement thanks to the inclination of the projections 15 and the grooves 27 and to the fact that both are relatively short, so that the cover is brought from a starting position to a final position of complete screwing through a fraction of turn. After the screwing has been completed, by imparting a further torsion to the cover, the teeth 28 are driven to move over the back of the teeth 17 of the case, which is possible due to the fact that they both are inclined the same way. After this operation, the fastening of the cover has been

come irreversible, that is permanent, since the unscrewing thereof is prevented by the ratchet and gear engagement between the two arrays of teeth 17 and the teeth 28 with each tooth 17 acting as a ratchet or pawl with respect to the teeth 28 on the cover so that this latter can no longer be turned in a direction opposed to the one that caused the screwing thereof.

This way it becomes possible to assemble together the case and the cover by means of a simple and quick mechanical operation. When the cover has been fastened, the sleeve 29 defining the axial hole 19 is fitted into the tube 4 (Fig. 1) and thanks to its slightly frusto-conical external configuration, it ensures the seal between the incoming fuel flow through the holes 20 and the outlet fuel flow through the hole 19.

Figures 4 and 5 show an embodiment of the screwing system of the cover to the case obtained by means of helical grooves 15' on the collar 14' of the case 1' below which are located the clamping teeth 17' outwardly directed and by means of relatively short projections 27' and inclined inwardly of the collar of the case under which projections are provided the teeth 28' turned inwardly of the cover and correspondingly oblique with respect to the teeth 17' on the collar of the case.

The operation of the above illustrated filter is well known: the fuel to be filtered, usually gas oil, penetrates the filter through the holes 20 and flows through the filter element 2 reaching the settlement chamber 10. Here the water and other settled impurities to be periodically drained through the hole 12 are collected, then the filter fuel flows upwardly through the axial hole 8 from the tube 4 and comes out through the central hole 19 in the cover 3.

Figures 6 and 7 show another embodiment of the filter cover according to the invention, generally designated with 30.

Such cover can be fastened the same way as shown above for the cover 3 to the case 1 since the portion to be mated with the case is the same in both embodiments. The difference between the cover 30 and the cover 3 is that the cover 30 is provided with elbow ducts 32 and 33 integrally formed with the cover body by moulding, for the fuel inlet into and the fuel outlet from the filter, respectively. Duct 32 opens into the filter chamber 34 over the filter element, whereas duct 33 is located at an axial position aligned with the tube 4 that has already been discussed with reference to the case 1. An air venting hole 35 is further provided for in the cover which is normally closed by a screw 36. A frusto-conical collar or sleeve 39 projecting within the cover is provided for the seal connection between the tube 4 and the case 1.

By assembling together the cover 30 and the case 1 one obtains a filter that needs no longer to be screwed for the connection to the fuel supply line, but rather one that is to be directly connected to the line

through the ducts 32 and 33. The connection is achieved by fitting the end portions of the ducts 32 and 33 into the pipes of the fuel supply line and blocking them together by means of hose clamps.

Figures 8 and 9 show a third embodiment of the cover generally designated at 40. The cover 40 is different from the previous illustrated embodiments in that the ducts 41 and 42 are of the quick connection type. They are provided with portions 43 and 44 adapted to sealingly fitting corresponding portions provided at the ends of the fuel supply pipes (not shown). Such portions include one or more seal gaskets and allow for the pipe fastening by simply press fitting of the portions 43 and 44 of the ducts 41 and 42. Several types of quick coupling devices are commercially available.

Figures 10 and 11 show a fourth embodiment of the cover that is on the whole designated at 50. In this embodiment the ducts 51 and 52 are no longer integrally formed with the cover, but rather separately built and then rotatably mounted on the cover. The cover therefore is provided with two holes having a proper diameter to receive the ducts 51 and 52. In the axial hole into which the outlet duct 52 is fitted there is provided a gasket 54 formed by two sealing ribs held in the proper position by a rigid insert 55 that in turn is equipped with a rib 56 binding the axial position thereof. The lower portion of the duct is slightly conical and is formed with a tooth 58 so as to allow the insertion into the hole and prevent the later extraction thereof. The inlet duct 51 is fitted into the peripheral hole formed in a portion of the cover having a reduced thickness with respect to the central portion. Consequently the gasket 59 is a simple seal ring, e.g. an O ring, again held in position by an insert 60 equipped with a fastening rib 61. The ducts 51 and 52 can be formed with quick coupling connections 63 and 64, or being terminated by conventional components requiring hose clamps for the fastening of the gas oil supply pipes, as shown in Figures 6 and 7.

Thanks to the embodiment shown in Figures 10 and 11 the elbow ducts 51 and 52 can be radially oriented as desired in order to select the optimum position for mounting the filter in the gas oil supply line to the engine.

## Claims

1. A fuel filter for an internal combustion engine comprising a plastic material cylindrical case (1; 1') housing a filter element (2) above a settlement chamber (10) defined at the case bottom, and a cover (3; 3'; 30) also of plastic material for closing said case (1), provided with fuel inlet openings (20; 32) and fuel outlet openings (19; 33), characterized in that said case (1; 1') terminates with an upper collar (14; 14') provided with helical

screwing means (15; 15') adapted to cooperate with complementary helical screwing means (27; 27') on the collar of the cover (3; 3'; 30), and in that said screwing means (15; 15' and 27; 27') are both associated with clamping oblique teeth (17; 17') for the permanent blocking of said cover (3; 3'; 30) to said case (1; 1').

2. A filter as claimed in claim 1, characterized in that said case (1) has a tapered collar (14) and in that the cover (3) has a circular groove (21) with a conical cross section adapted to receive the tapered collar (14) of the case.
3. A filter as claimed in claims 1 and 2, characterized in that the helical screwing means on the collar of the case (1) and those on the collar of the cover (3) are made up by relatively short helical projections and inclined (15) and helical grooves (27), respectively, and in that the oblique teeth (17) associated to the projections (15) and those (28) associated to the grooves (27) are located on the rest projection (16) of the collar (14) of the case (1) as an upwardly directed array and on the collar of the cover (3) as a downwardly directed array, respectively, said oblique teeth being adapted to prevent the unscrewing of the cover (3) from the case (1).
4. A filter as claimed in claim 1, characterized in that the helical screwing means on the collar (14') of the case (1') and on the collar of the cover (3') are made up by helical grooves (15') and relatively short and inclined helical projections (27'), respectively, and in that the oblique teeth (17') associated to the helical grooves (15') and those (28') associated to the helical projections (27') are both located as an array below the grooves (15') of the case (1) and below the projections (27') of the cover (3'), respectively, said oblique teeth (17') and (28') being adapted to prevent the unscrewing of the cover (3') from the case (1').
5. A filter as claimed in claim 1, characterized in that the bottom of said settlement chamber (10) of the case (1; 1') is provided with radially extending projections (5) that terminate before the center of the case and upwardly define a flat rest surface for said filter element (2).
6. A filter as claimed in claim 1, characterized in that said cover (3; 3') is provided with eccentric holes (20) for the fuel inlet and with an axial threaded hole (19) for the fuel outlet and the filter fastening, and with a pair of ring-shaped seal gaskets (22, 23) forcibly received in seats (24, 25) one (25) of which being located between said threaded axial hole (19) and said eccentric holes (20).

and the other (24) of which being located outside said eccentric holes (20).

7. A filter as claimed in claim 6, characterized in that said thread d axial hole (19) is defined in a sleeve terminating downwardly with a frusto-conical portion (29) for the coupling with a tube (4) of the filter element (2).

8. A filter as claimed in claim 1, characterized in that said cover (30) is provided with fuel inlet ducts (32) and outlet ducts (33) that are integrally formed with said cover and are elbow-bended outside it.

9. A filter as claimed in claim 8, characterized in that said inlet ducts are equipped with quick connection fixes or connections (43, 44) for the connection to the fuel supply line.

10. A filter as claimed in claim 1, characterized in that said cover (50) is equipped with fuel inlet ducts (51) and fuel outlet ducts (52) separately formed from the cover (50) and rotatably mounted into holes in said cover.

11. A filter as claimed in claim 10, characterized in that between said elbow ducts (51, 52) and said cover holes there are interposed a seal gasket (59; 54) and an insert (60; 53) for the fastening of said gasket.

5

10

15

20

25

30

35

40

45

50

55

Bund (14) aufweist und der Deckel (3) in zur Aufnahme des konisch verjüngten Bundes (14) des Gehäuses ausgelegte kreisförmige Nut (21) mit konischem Querschnitt aufweist

3. Filter nach den Ansprüchen 1 und 2, dadurch gekennzeichnet, daß die schraubenförmigen Schraubeinrichtungen am Bund des Gehäuses (1) und jene am Bund des Deckels (3) durch relativ kurze schraubenförmige Vorsprünge bzw. geneigte (15) und schraubenförmige Nuten (27) gebildet sind, und daß die den Vorsprüngen (15) zugehörigen schrägen Zähne (17) und die den Nuten (27) zugehörigen Zähne (28) am Auflagevorsprung (16) des Bundes (14) des Gehäuses (1) als aufwärts gerichtete Gruppierung bzw. am Bund des Deckels (3) als abwärts gerichtete Gruppierung angeordnet sind, wobei die schrägen Zähne so ausgelegt sind, daß sie ein Abschrauben des Deckels (3) vom Gehäuse (1) verhindern.

4. Filter nach Anspruch 1, dadurch gekennzeichnet, daß die schraubenförmigen Schraubeinrichtungen am Bund (14') des Gehäuses (1') und am Bund des Deckels (3') durch schraubenförmige Nuten (15') bzw. relativ kurze und geneigte Vorsprünge (27') gebildet sind, und daß die den schraubenförmigen Nuten (15') zugehörigen schrägen Zähne (17') und die den schraubenförmigen Vorsprüngen (27') zugehörigen Zähne (28') beide als Gruppierung unterhalb der Nuten (15') des Gehäuses (1) bzw. unterhalb der Vorsprünge (27') des Deckels (3') angeordnet sind, wobei die schrägen Zähne (17') und (28') so ausgelegt sind, daß sie ein Abschrauben des Deckels (3') vom Gehäuse (1') verhindern.

5. Filter nach Anspruch 1, dadurch gekennzeichnet, daß der Boden der Absetzkammer (10) des Gehäuses (1; 1') mit radial verlaufenden Vorsprüngen (5) versehen ist, die vor dem Mittelpunkt des Gehäuses enden und nach oben hin eine flache Aufnahmefläche für das Filterelement (2) bilden.

6. Filter nach Anspruch 1, dadurch gekennzeichnet, daß der Deckel (3; 3') mit exzentrischen Löchern (20) für den Kraftstoffeintritt und mit einem axialen Gewindeloch (19) für den Kraftstoffaustritt und für die Filterbefestigung sowie mit einem Paar ringförmiger Dichtungen (22, 23) versehen ist, welche in Aufnahmen (24, 25) eingepreßt sind, wobei in den eine (25) zwischen dem axialen Gewindeloch (19) und dem zentralen Löchern (20) angeordnet und die andere (24) außerhalb der exzentrischen Löcher (20) angeordnet ist.

### Patentansprüche

1. Kraftstofffilter für einen Verbrennungsmotor, umfassend ein zylindrisches Gehäuse (1; 1') aus Plastikmaterial zur Aufnahme eines Filterelements (2) über einer am Gehäuseboden festgelegten Absetzkammer (10), und einen Deckel (3; 3'; 30), ebenfalls aus Plastikmaterial, zum Verschließen des Gehäuses (1), welcher mit Kraftstoff-Eintrittsöffnungen (20; 32) und Kraftstoff-Austrittsöffnungen (19; 33) versehen ist, dadurch gekennzeichnet, daß das Gehäuse (1; 1') in einem oberen Bund (14; 14') endet, der mit schraubenförmigen Schraubeinrichtungen (15; 15') versehen ist, die so ausgelegt sind, daß sie mit komplementären schraubenförmigen Schraubeinrichtungen (27; 27') am Bund des Deckels (3; 3'; 30) zusammenwirken, und daß beide Schraubeinrichtungen (15; 15' und 27; 27') mit schrägen Klemmzähnen (17; 17') zur permanenten Blockierung des Deckels (3; 3'; 30) am Gehäuse (1; 1') kombiniert sind.

2. Filter nach Anspruch 1, dadurch gekennzeichnet, daß das Gehäuse (1) in einen konisch verjüngt

5

7. Filter nach Anspruch 6, dadurch gekennzeichnet, daß das axial Gewindeloch (19) in einer Hülse definiert ist, welche unten in einem kegelstumpfförmigen Abschnitt (29) zum Ankuppeln eines Rohres (4) des Filterelements (2) dient. 5

8. Filter nach Anspruch 1, dadurch gekennzeichnet, daß der Deckel (30) mit Kraftstoffeintrittskanälen (32) und Kraftstoffaustrittskanälen (33) versehen ist, welche integral mit dem Deckel ausgebildet und außerhalb desselben knieförmig gebogen sind. 10

9. Filter nach Anspruch 8, dadurch gekennzeichnet, daß die Eintrittskanäle mit Schnellverbindungsverschlüssen oder -anschlüssen (43, 44) zur Verbindung mit der Kraftstoffversorgungsleitung ausgestattet sind. 15

10. Filter nach Anspruch 1, dadurch gekennzeichnet, daß der Deckel (50) mit Kraftstoffeintrittskanälen (51) und Kraftstoffaustrittskanälen (52) versehen ist, welche vom Deckel (50) getrennt ausgebildet und drehbar in Löchern im Deckel gelagert sind. 20

11. Filter nach Anspruch 10, dadurch gekennzeichnet, daß zwischen den knieförmig gebogenen Kanälen (51, 52) und den Deckellochern eine Dichtung (59; 54) und ein Einsatzteil (60; 55) zur Befestigung der Dichtung eingesetzt sind. 25

#### Revendications

1. Filtre de carburant pour un moteur à combustion interne comprenant un boîtier cylindrique en matière plastique (1, 1') logeant un élément de filtre (2) au-dessus d'une chambre de décantation (10) définie au fond du boîtier, et un couvercle (3 ; 3'; 30), également en matière plastique pour fermer ledit boîtier (1), muni d'orifices d'entrée de carburant (20 ; 32) et d'orifices de sortie de carburant (19 ; 33), caractérisé par le fait que ledit boîtier (1 ; 1') se termine par une collerette supérieure (14 ; 14') pourvue d'un moyen de vissage hélicoïdal (15 ; 15') apte à coopérer avec un moyen de vissage hélicoïdal complémentaire (27 ; 27') sur la collerette du couvercle (3; 3'; 30), et par le fait que lesdits moyens de vissage (15 ; 15' et 27; 27') sont tous deux associés avec des dents obliques de verrouillage (17 ; 17') pour le blocage permanent dudit couvercle (3 ; 3' ; 30) audit boîtier (1 ; 1'). 35

2. Filtre selon la revendication 1, caractérisé par le fait que ledit boîtier (1) possède une collerette chanfreiné (14) et par le fait que le couvercle (3) possède une gorge circulaire (21) avec un sec- 40

tion transversale conique apte à recevoir la collerette chanfreiné (14) du boîtier. 5

3. Filtre selon les revendications 1 et 2, caractérisé par le fait que le moyen de vissage hélicoïdal sur la collerette du boîtier (1) et celui sur la collerette du couvercle (3) sont constitués par des saillies hélicoïdales relativement courtes et inclinées (15) et respectivement des gorges hélicoïdales (27), et par le fait que les dents obliques (17) associées aux saillies (15) et celles (28) associées aux gorges (27) sont situées sur la saillie d'appui (16) de la collerette (14) du boîtier (1) sous la forme d'une rangée orientée vers le haut, et respectivement sur la collerette du couvercle sous la forme d'une rangée orientée vers le bas, lesdites dents obliques étant aptes à empêcher le dévisage du couvercle (3) du boîtier (1). 10

4. Filtre selon la revendication 1, caractérisé par le fait que les moyens de vissage hélicoïdaux sur la collerette (14') du boîtier et sur la collerette du couvercle (3') sont constitués par des gorges hélicoïdales (15') et respectivement des saillies hélicoïdales relativement courtes et inclinées (27'), et par le fait que les dents obliques (17') associées aux gorges hélicoïdales (15') et celles (28') associées aux saillies hélicoïdales (27') sont toutes situées sous la forme d'une rangée en-dessous des gorges (15') du boîtier (1) et respectivement en-dessous des saillies (27') du couvercle (3'), lesdites dents obliques (17') et (28') étant aptes à empêcher le dévissage du couvercle (3') du boîtier (1'). 15

5. Filtre selon la revendication 1, caractérisé par le fait que le fond de ladite chambre de décantation (10) du boîtier (1 ; 1') est munie de saillies (5) s'étendant radialement qui se terminent avant le centre du boîtier et définissent vers le haut une surface d'appui plane pour ledit élément de filtre (2). 20

6. Filtre selon la revendication 1, caractérisé par le fait que ledit couvercle (3 ; 3') est muni de trous excentriques (20) pour l'entrée du carburant et d'un trou axial taraudé (19) pour la sortie du carburant et la fixation du filtre, et d'une paire de joints annulaires (22, 23) logés à force dans des sièges (24, 25) dont l'un (25) est disposé entre ledit trou axial taraudé (19) et lesdits trous excentriques (20) et dont l'autre (24) est disposé à l'extérieur desdits trous excentriques (20). 25

7. Filtre selon la revendication 6, caractérisé par le fait que ledit trou axial taraudé (19) est défini dans un manchon s'terminant vers le bas par une partie tronconique (29) pour le couplage avec un 30

tub (4) de l'élément d filtr (2).

8. Filtre selon la revendication 1, caractérisé par le fait qu'ledit couvercle (30) est muni de conduits d'entrée (32) et de conduits de sortie (33) de carburant qui sont réalisés d'un seul tenant avec ledit couvercle et sont coudés à l'extérieur de celui-ci. 5
9. Filtre selon la revendication 8, caractérisé par le fait que lesdits conduits d'entrée sont équipés de raccords ou de connecteurs (43, 44) à connexion rapide pour la connexion à la ligne d'alimentation en carburant. 10
10. Filtre selon la revendication 1, caractérisé par le fait que ledit couvercle (50) est équipé de conduits d'entrée de carburant (51) et de conduits de sortie de carburant (52) formés séparément du couvercle (50) et montés à rotation dans des trous dudit couvercle. 15 20
11. Filtre selon la revendication 10, caractérisé par le fait qu'entre lesdits conduits coudés (51, 52) et lesdits trous du couvercle sont interposés un joint d'étanchéité (59 ; 54) et un insert (60 ; 53) pour un serrage dudit joint. 25

30

35

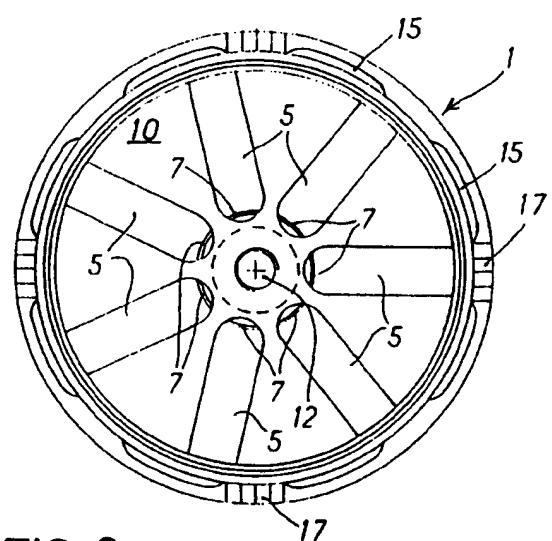
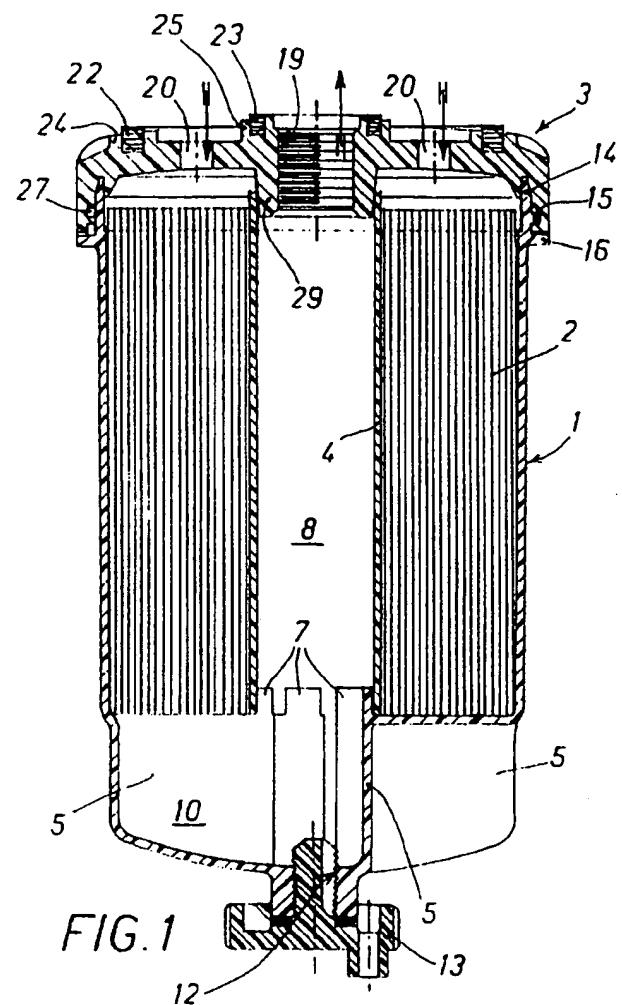
40

45

50

55

7



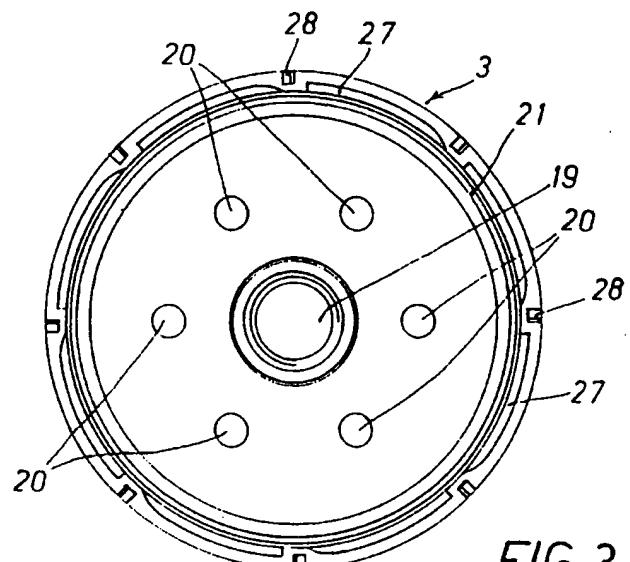


FIG. 3

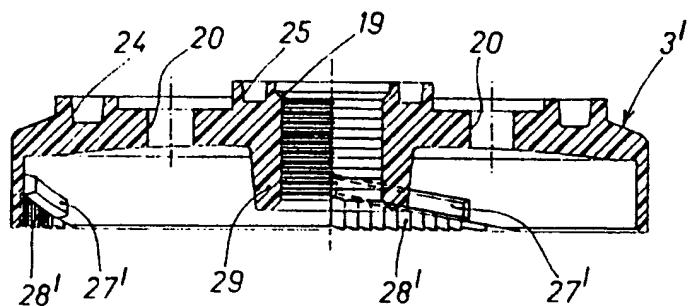


FIG. 4

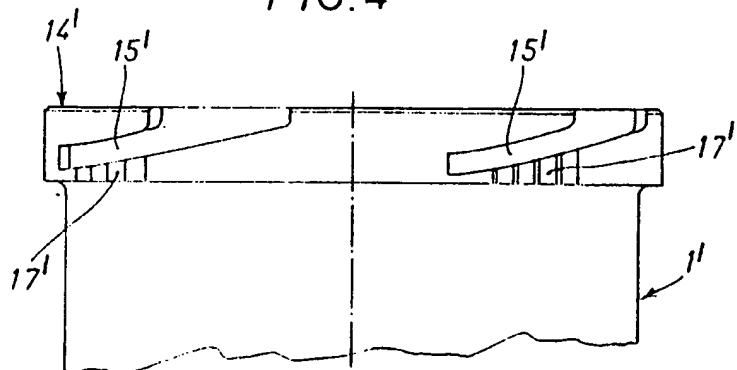


FIG. 5

FIG. 6

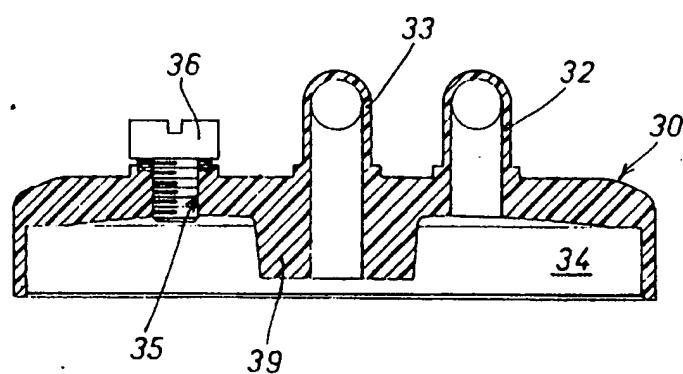
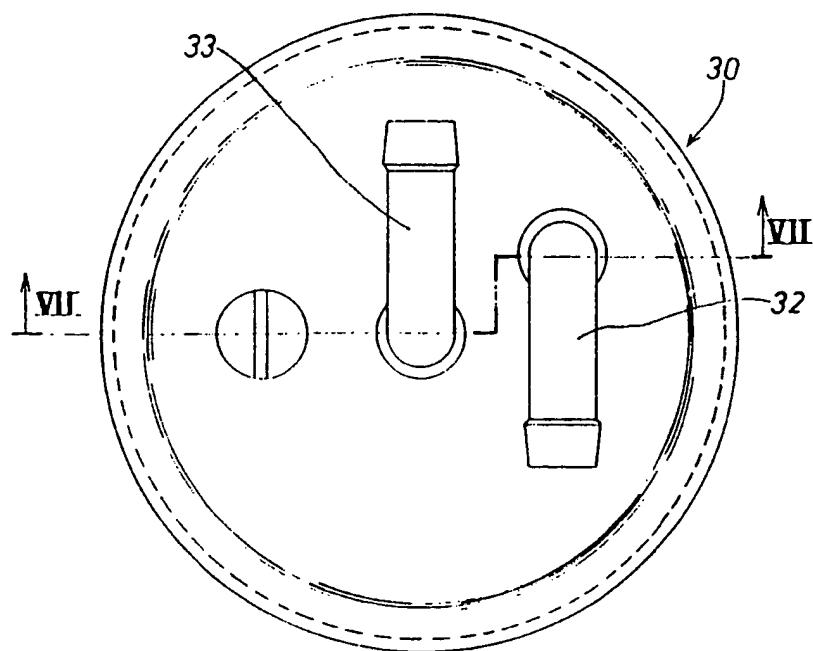


FIG. 7

FIG. 8

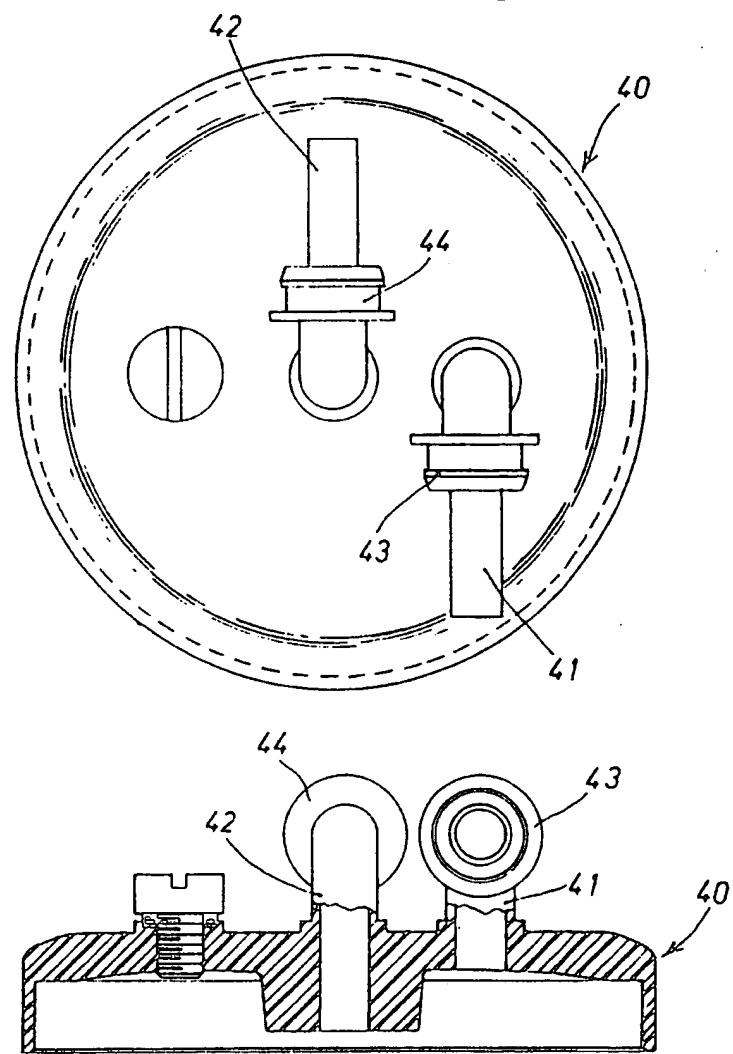


FIG. 9

FIG. 10

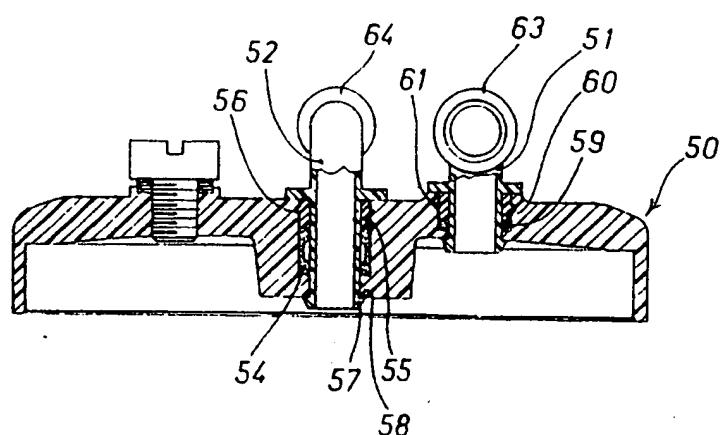
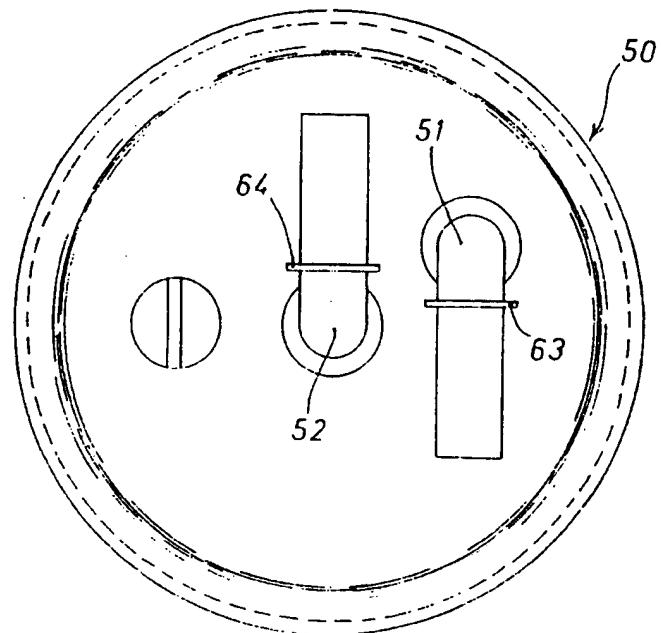


FIG. 11